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"SPACELAB" FLIGHT SIMULATED BY TWO MONKEYS
AT CERMA

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"SPACELAB" FLIGHT SIMULATED BY TWO MONKEYS AT CERMA

The Center for Study and Research of Aerospace medicine * 1 (CERMA) has just completed on February 18 to 29 simulation in the laboratory of a ten day flight in "Spacelab" with the prototype of the new "Module for two primates", developed by CERMA in cooperation with the Matra Company, under contract to DRET and to CNES. This experimental biolaboratory should in principle - if things work out - fly aboard NASA's "Spacelab" in the coming years; the mission was initially planned for 1984! This is the first "vehicle" for biomedical studies that France will be able to launch into space since the experiments, also performed by CERMA, in the sixties on rats, cats and monkeys.

The Module for two primates of CERMA is also a more elaborate instrument than that of the American biolaboratory project conceived by McDonnell Douglas (with monkeys in cages) under contract to NASA. It will make possible performance of more pressing experiments of spatial physiology concerning the study of the effects of the spatial environment (weightlessness, accelerations, radiation, confinement, etc.) on the vital functions of the organism, not only to assure the survival of the equipment, but more particularly to increase the operational capacity in optimum conditions.

SPACE SICKNESS

The human space flights performed by the USA and USSR during the past few years, and in particular the Soviet flights of long duration, have already demonstrated that Man could live and work in a weightless state for at least six months.

But, if the conditions of the space flights have already been relatively well tolerated by the equipment, we have still system-

atically found "disorder" of behavior, especially in the first 1

*Numbers in margin indicate pagination in foreign text

three or four days of flight. These disorders do not alter the health of the astronauts, however they do reduce their performances detectably.

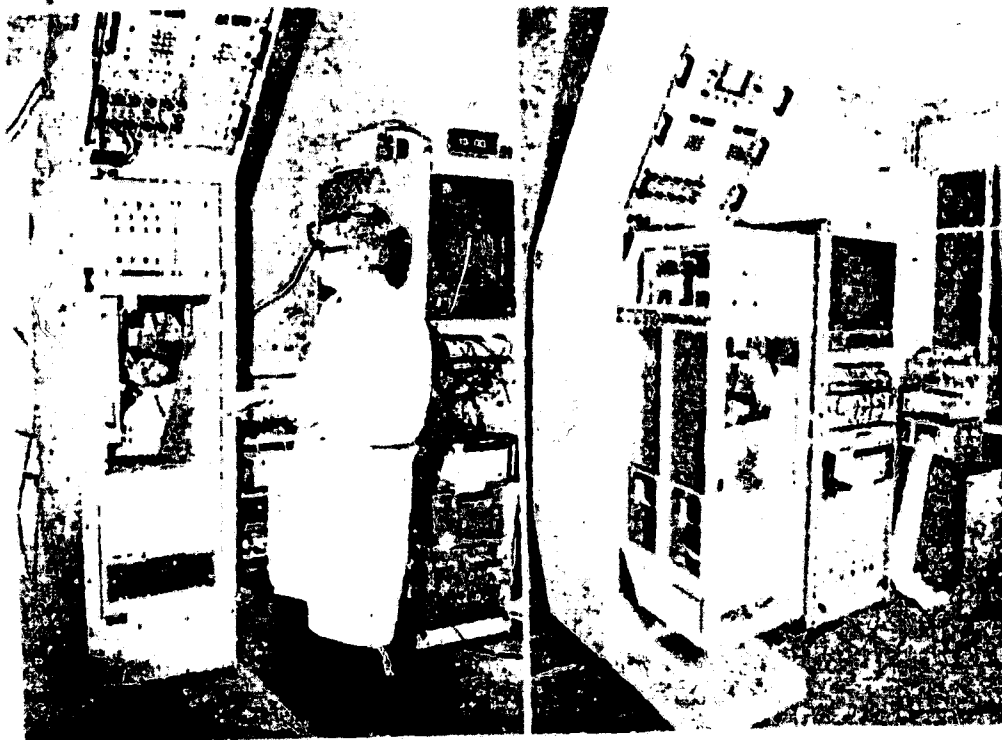
These disorders are familiar from now on: psychosensual troubles (space sickness), problems with metabolism, with circulation, with circadian rhythm, with behavior, etc. The cosmonauts lose weight (water losses), muscles atrophy, bone calcium decreases, etc.

But the pathophysiological causes of these disorders are still poorly understood; despite the progress of human space flights. To elucidate them, it is in fact necessary to proceed with dangerous or traumatic "investigations", impossible to perform on men. From this arises the necessity to again to make recourse of experimental animals.

THE SPACE-PRIMATE GROUP

The Module for two primates, built under the direction of Professor P. C. Pesquies with the staff of CERMA, is exactly planned for the study of the pathophysiological mechanisms of the disorders of adaptation to weightlessness, especially that of short term. It will make possible, during flights of a week to a month in "Spacelab", performance of different experiments concerning visual and vestibular functions, the cardiovascular system, cerebral blood flow, myocardial energy, central nervous system, hydroelectric metabolism, calcium-phosphorus metabolism and the mineralization of the bony tissues.

A European Group for Space-primate studies has in addition been created in the last year (Cf. Air et Cosmos, No. 775) by Professor M. Burgeat of the Lariboisiere-Saint Louis Faculty of medicine, with some forty European **physicians** and biologists



Prototype of the Module for two primates presented by Professor Pesquies of CERMA in the configuration of flight. Two primates can be made out seated side by side inside of it during the flight simulation (photograph by Michel Isaac). The prototype of the module for two primates presently being tested at CERMA (at right) was constructed by the Revision Workshop of the Army of the Air (ARAA) at Bordeaux.

(French, Belgian, Italian, Danish, Swedes and Britains) in order to prepare these experiments.

The Module for two primates is a semi-automatic apparatus weighing 180 kg and designed to shelter two Rhesus monkeys weighing 8 to 10 kg, seated side by side in a compartment (standard rack) placed in the interior of the manned module of "Spacelab". The presence of the two monkeys should make possible reduction of the emotional stresses due to the isolation which had previously caused the failure of the mission of NASA's "Biosatellite 3".

The monkeys in the module are fed air, water and food (in pellets); urine and fecal matter are automatically collected by the apparatus. The physiological parameters of the primates (arterial pressure, respiratory rate and cardiac rate, temperature, etc.) and the environmental parameters (temperature, pressure, humidity, sound, light etc.) are under surveillance constantly during the flight.

The work expended in perfecting the Module for two primates in addition will make possible creation of what biologists call the "chronic macaco", which means a primate in whom different physiological microreceptors will be implanted permanently. This "guinea pig" will serve well especially in the studies for National defense, concerning for example, the response of the human organism to the very strong accelerations encountered in the new combat airplanes.

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